Discussion

Why are dynamical models not able to forecast with more skill than statistical models?

Two answers from extreme points of view:

1. They could and they should, but our implementation is insufficient or incompetent.

2. It's hopeless: It is impossible to initialize and resolve convection, shear, and boundary layer dynamics with current or near-future models and CPU limits.
   Or maybe ever: the predictability limit is too close.

   (Mark DeMaria, circa 1990?)

Consider some current realities:

- Current dynamical and statistical models are using nearly identical information:

  GFS forecasts of the surrounding environment, SST/heat content, and land.

- Statistical models (DSHP, LGEM) have almost no knowledge of “structure”:

  The wind profile V(r), wind asymmetries, dry air slots, etc.

  But they *do* have skill. Why?

  → Because the near-field environment has *very strong* control on TC evolution.

  After 36 hours, environmental control dominates.

- On the other hand, dynamical models should have knowledge of structure, and should be able to use it.

  Assimilation methods for inner-core information exist, but:

  → They are computationally expensive

  → The majority of the time detailed inner-core information is not available

  → Incorrect operational analyses (+/- 15 knots!) will hurt, probably more so for dynamical models

- In addition, dynamical models may not be able to take advantage of environmental control because:

  → Regional/global model mismatches lead to intermediate-scale errors
  This leads to incorrect environmental control, and incorrect forecasts

  → Incorrect initialization also corrupts the intermediate-scale interactions

Based on our discussion over the last 24 hours, here is what I think:

1. Given the computational constraints, moving HWRF to a 3km nest was an over-reach. The short-cuts used to make the model run in the time window are too extreme.

   If you think I am wrong, prove it: Run HWRF hindcasts with successively-less short-cuts and show that a) the model behaves properly, and b) the improvements are marginal.

2. Give highest priority to the "structural" problems that make it difficult to evaluate HWRF compared to OBS and compared to other models.

   Then proceed with more challenging advances: microphysics, PBL, DA.

1. Jim Doyle's talk today shows that an open-minded, flexible approach to vortex initialization can achieve great results at much less cost.